Standard 10
MATHS

Time: 3.00 Hours   **Part - I**   Marks: 100

Answer all the questions   **14×1=14**

1) The range of the relation $R = \{(x, x^2/x$ is a prime number less than 13\} is
   a) $\{2, 3, 5, 7\}$ b) $\{2, 3, 5, 7, 11\}$
   c) $\{4, 9, 25, 49, 121\}$ d) $\{1, 4, 9, 25, 49, 121\}$

2) If $f: A \rightarrow B$ is a constant function, then the range of f will have .... elements
   a) 1   b) 0   c) n(A)   d) Infinity

3) The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
   a) 2025   b) 5220   c) 5025   d) 2520

4) The sum of cubes of first natural numbers is .... of the first n natural numbers
   a) cube   b) square   c) times   d) equal

5) The solution of $(2x - 1)^2 = 9$ is equal to
   a) -1 b) 2   c) $-1, 2$ d) None of these

6) Find is the order of the matrix $\begin{pmatrix} \sin\theta \\ \cos\theta \\ \tan\theta \end{pmatrix}$
   a) 3×1 b) 3×3 c) 1×3 d) 1×1

7) A tangent is perpendicular to the radius at the
   a) centre   b) point of contact   c) infinity   d) chord

8) The slope of the line joing (12, 3) (4, a) is $\frac{1}{8}$. The value of 'a' is
   a) 1   b) 4   c) -5 d) 2

9) The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is
   a) $7x - 3y + 4 = 0$ b) $3x - 7y + 4 = 0$ c) $3x + 7y = 0$ d) $7x - 3y = 0$

10) If the ratio of the height of a tower and the length of its shadow is $\sqrt{3} : 1$, then the angle of elevation of the sun has measure
    a) $45°$ b) $30°$ c) $90°$ d) $60°$

11) The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is
    a) $1 : 2 : 3$ b) $2 : 1 : 3$ c) $1 : 3 : 2$ d) $3 : 1 : 2$

12) The height of a right circular cone whose radius is 5cm and slant height is 13 cm will be
    a) 12cm   b) 10cm   c) 13cm   d) 5cm

13) Which of the following is not a measure of dispersion?
    a) Range   b) Standarad deviation
    c) Arithmetic mean   d) Variance

14) What will be the probability that a non-leap year will have 53 saturdays?
    a) $\frac{2}{7}$ b) $\frac{53}{7}$ c) $\frac{1}{53}$ d) $\frac{1}{7}$

Part - II

Answer any 10 questions. (Q.No. 28 is compulsory)   **10×2=20**

15) Let f be a function $f: N \rightarrow N$ be defined by $f(x) = 3x + 2, x \in N$ then find the images of 1, 2, 3

16) The general term of a sequence is defined as $a_n = \begin{cases} n(n+3); n \in N \text{ is odd} \\ n^2 + 1; n \in N \text{ is even} \end{cases}$ find the 15th and 20th terms

17) Find the sum $3 + 1 + \frac{1}{3} + \ldots \alpha$

18) If $A = \begin{pmatrix} 0 & 4 & 9 \\ 8 & 3 & 7 \end{pmatrix}$, $B = \begin{pmatrix} 7 & 3 & 8 \\ 1 & 4 & 9 \end{pmatrix}$ find the value of B–5A

19) What length of ladder is needed to reach a height of 7 ft along the wall when the base of the ladder is 4ft from the wall? Round off your answer to the next tenth place

20) A Cat is located at the point (–6, –4) in xy plane. A bottle of milk is kept at (5, 11). The cat wish to consume the milk travelling through shortest possible distance. Find the equation of the path it needs to table its milk

21) Find the equation of a stright line which is parallel to the line 3x–7y=12 and passing through the point (6, 4)

22) Prove: $\dfrac{\cos\theta}{1+\sin\theta} = \sec\theta - \tan\theta$

23) Find the angle of elevation of the top of a tower from a point on the ground, Which is 30m away from the foot of a tower of height $10\sqrt{3}$m

24) The radius of spherical balloon increases from 12cm to 16cm as air being pamped into it. Find the ratio of the surface area of the balloons in the two cases.

25) The volume of a solid right circular cone is 11088 cm³. If its height is 24cm then find the radius of the cone.

26) Find the standard deviation of first 21 natural numbers

27) A bag contains 5 blue balls and 4 green balls. A ball is drawn at random from the bag. Find the probability that the ball drawn is (i) blue (ii) not blue

28) If $P = \dfrac{x}{x+y}$ and $Q = \dfrac{y}{x+y}$ then find $\dfrac{1}{P^2 - Q^2}$

Part - III

Answer any 10 questions. (Q.No. 42 is compulsory)   **10×5=50**

29) The function 't' which maps temperature in celsius (c) into temperature in Fahrenheit (F) is defined by t(c) = F. Where $F = \frac{9}{5}C + 32$ find, (i) t(0) (ii) t(28) (iii) t(–10) (iv) the value of C when t(c) = 212 (v) the temperature when the celsius value is equal to the Farenheit value

30) Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8, C=The set of even prime number. Verify that A×(B–C)=(A×B)–(A×C).

31) How many terms of the series 1 + 5 + 9 + ... must be taken so that thier sum is 190?

32) Find the sum of the following series 15²+16²+......25²

33) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{bmatrix}$ show that $(AB)^T = B^T A^T$

34) State and prove Pythagoras theorem

35) Find the value of k, if the area of a quadrilateral is 28 sq.units, whose vertices are taken in the order (–4, –2) (–3, k) (3, –2) and (2, 3)

36) Prove analytically that the tone segment joining the mid-points of two sides of a triangle is parallel to the third side and is equal to half of its length

37) From the top of a tower 50 m high, the angles of depression of the top and bottom of a tree are observed to be 30° and 45° respectively. Find the height of the tree.

38) Nathan, an engineering student was asked to make a model shaped like a cycliner with two cones attached at its two ends. The diameter of the model is 3cm and its length is 12cm. If each cone has a height of 2cm, find the volume of the model that Nathan made.

39) A cone of height 24cm is made up of modeling clay. A child reshapes it in the form of a cylinder of same radius as cone. Find the height of the cylinder

40) Find the standard deviation of 7, 9, 10, 11, 13

41) Three unbiased coins are tossed once. Find the probability of getting atmost 2 tails or atleast 2 heads

42) If $x = \dfrac{a^2 + 3a - 4}{3a^2 - 3}$ and $y = \dfrac{a^2 + 2a - 8}{2a^2 - 2a - 4}$ find the value of x^2y^{-2}

Part - IV

Answer the following.   2×8=16

43) a) Construct a triangle similar to a given triangle LMN with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle LMN (scale factor $\frac{4}{5}$ <1)

(OR)

b) Construct a ΔPQR which the base PQ=4.5cm, $\lfloor R = 35°$ and the median RG from R to PQ is 6cm.

44) a) Graph the following quadratic equation and state their nature of solutions. x²–4x+4=0

(OR)

b) A bus in travelling at a uniform speed of 50km/hr. Draw the distance - time graph and hence find
   i) the constant of variation
   ii) how far will it travel in 90 minutes?
   iii) the time required to cover a distance of 300km from the graph.

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